In the Claims

The following is a complete listing of the claims and replace all prior claims in the application:

1. (currently amended) A magnetic tunnel junction device, comprising:

a first magnetic layer and a second magnetic layer, at least one of the first and the second magnetic layers configured to include diffusion components selected to adjust one or more properties of the tunnel junction device; and

a barrier layer disposed between the first and the second magnetic layers comprising diffusion components from the at least one magnetic layer only in a diffusion region, wherein the diffusion components adjust the one or more properties of the tunnel junction device, and wherein the diffusion region comprises a diffusion component-specific depth profile.

2. (original) The device of claim 1, wherein the diffusion components are selected to reduce a series resistance of the barrier layer.

3. (original) The device of claim 1, wherein the diffusion components are selected to decrease a bandgap of the barrier layer.

4. (original) The device of claim 1, wherein the diffusion components are selected to passivate an interface of the barrier layer.

5. (original) The device of claim 1, wherein:

the first magnetic layer is a pinned magnetic layer; and

the second magnetic layer is a free magnetic layer.

6. (original) The device of claim 1, wherein at least one of the first and the second magnetic layers is a multi-layer structure.

7. (currently amended) The device of claim 1, wherein ~~the at least one layer~~ at least one of the first and the second magnetic layers comprises an alloy of CoFe.

8. (original) The device of claim 7, wherein the alloy of CoFe comprises CoFeHf.

9. (original) The device of claim 8, wherein the CoFeHf comprises about 5 to about 10 atomic percent Hf.

10. (original) The device of claim 7, wherein the alloy including CoFe comprises CoFeZr.

11. (original) The device of claim 10, wherein the CoFeZr comprises about 5 to about 10 atomic percent Zr.

12. (original) The device of claim 1, wherein the diffusion components comprise Hf.

13. (original) The device of claim 1, wherein the diffusion components comprise Zr.

14. (canceled) The device of claim 1, wherein the barrier layer has a thickness of about 3 to about 6 Å.

15. (original) The device of claim 1, wherein the barrier layer including the migrated diffusion components comprises $AlHfO_x$.

16. (original) The device of claim 1, wherein the barrier layer including the migrated diffusion components comprises $AlZrO_x$.

17. (currently amended) A magnetic tunnel junction sensor, comprising:

a magnetic tunnel junction device comprising:

a first magnetic layer and a second magnetic layer, at least one of the first and the second magnetic layers configured to include diffusion components selected to adjust one or more properties of the tunnel junction device; and

a barrier layer between the first and the second magnetic layers, the barrier layer comprising diffusion components from the at least one magnetic layer only in a diffusion region, wherein the diffusion components adjust the one or more properties;

a current source coupled to the first magnetic layer and the second magnetic layer, and wherein the diffusion region comprises a diffusion component-specific depth profile; and

a magnetoresistance detector, coupled to the first and the second magnetic layers, for detecting an electrical resistance through the magnetic tunnel junction device based on magnetic orientations of the first and the second magnetic layers.

18. (original) The device of claim 17, wherein the diffusion components are selected to reduce a series resistance of the barrier layer.

19. (original) The device of claim 17, wherein the diffusion components are selected to decrease a bandgap of the barrier layer.

20. (original) The device of claim 17, wherein the second magnetic layer is a free magnetic layer.

21. (original) The device of claim 17, wherein the first magnetic layer is a pinned multi-layer magnetic structure.

22. (original) The device of claim 17, wherein the first magnetic layer comprises an alloy of CoFe.

23. (currently amended) The device of claim [[17]] 22, wherein the alloy of CoFe comprises CoFeHf.

24. (currently amended) The device of claim [[17]] 22, wherein the alloy of CoFe comprises CoFeZr.

25. (original) The device of claim 17, wherein the diffusion components comprise Hf.

26. (original) The device of claim 17, wherein the diffusion components comprise Zr.

27. (canceled) The device of claim 17, wherein the barrier layer has a thickness of about 3 to about 6 Å.

28. (original) The device of claim 17, wherein the barrier layer including the migrated diffusion components comprises $AlHfO_x$.

29. (original) The device of claim 17, wherein the barrier layer including the migrated diffusion components comprises $AlZrO_x$.

30. (currently amended) A magnetic storage system, comprising:

a movable magnetic recording medium;

a magnetic tunnel junction sensor for detecting magnetic signals on the moveable recording medium, comprising:

a first magnetic layer and a second magnetic layer, at least one of the first and the second magnetic layers configured to include diffusion components selected to adjust one or more properties of the tunnel junction sensor;

a barrier layer between the first and the second magnetic layers, the barrier layer including diffusion components from the at least one magnetic layer only in a diffusion region, wherein the diffusion components adjust the one or more properties, and wherein the diffusion region comprises a diffusion component-specific depth profile; and

a magnetoresistance detector, coupled to the first and the second magnetic layers, for detecting an electrical resistance through the magnetic tunnel junction sensor based on magnetic orientations of the first and the second magnetic layers; and

an actuator, coupled to the magnetic tunnel junction sensor, for moving the sensor relative to the medium.

31. (original) The device of claim 30, wherein the at least one of the first and the second magnetic layers comprises an alloy of CoFe.

32. (original) The device of claim 31, wherein the alloy of CoFe comprises CoFeHf.

33. (original) The device of claim 31, wherein the alloy of CoFe comprises CoFeZr.

34. (original) The device of claim 30, wherein the diffusion components comprise Hf.

35. (original) The device of claim 30, wherein the diffusion components comprise Zr.

36. (original) The device of claim 30, wherein the barrier layer including the migrated diffusion components comprises $AlHfO_x$.

37. (original) The device of claim 30, wherein the barrier layer including the migrated diffusion components comprises $AlZrO_x$.

38. (currently amended) A memory device, comprising:

an array of memory elements configured to store information for later access, each memory element comprising:

a first magnetic layer and a second magnetic layer, at least one of the first and the second magnetic layers configured to include diffusion components selected to adjust one or more properties of the memory element; and

a barrier layer between the first and the second magnetic layers, the barrier layer comprising diffusion components from the at least one magnetic layer only in a diffusion region, wherein the diffusion components adjust the one or more properties, and wherein the diffusion region comprises a diffusion component-specific depth profile.

39. (currently amended) A tunnel junction device, comprising:

means for providing a first magnetic layer incorporating diffusion components selected to adjust one or more properties of the tunnel junction device;

means for providing a second magnetic layer;

means for providing a tunnel barrier layer between the first and the second magnetic layers, the tunnel barrier layer including diffusion components from the first magnetic layer only in a diffusion region, wherein the diffusion components adjust the one or more properties of the tunnel junction device, and wherein the diffusion region comprises a diffusion component-specific depth profile.

40. (currently amended) A magnetic tunnel junction sensor, comprising:

means for providing a first magnetic layer configured to include diffusion components selected to adjust one or more properties of the tunnel junction sensor; and

means for providing a second magnetic layer;

means for providing a barrier layer between the first and the second magnetic layers, the barrier layer comprising diffusion components from the first magnetic layer only in a diffusion region, wherein the diffusion components alter the one or more properties, and wherein the diffusion region comprises a diffusion component-specific depth profile; and

means for measuring an electrical resistance through the first and the second magnetic layers and the barrier layer based on magnetic orientations of the first and the second magnetic layers.

41. (currently amended) A magnetic storage system, comprising:

means for storing magnetic data;

means for sensing the magnetically stored data, comprising:

means for providing a first magnetic layer configured to include diffusion components selected to alter one or more properties of the sensing means;

means for providing a second magnetic layer; and

means for providing a barrier layer between the first and the second magnetic layers, the barrier layer including diffusion components from the first magnetic layer only in a diffusion region and altering the one or more properties; and

means for detecting an electrical resistance through the means for sensing based on magnetic orientations of the first and the second magnetic layers; and

means for moving the means for sensing relative to the means for magnetic data ~~storage~~ storage.